PRINCETON POWER SYSTEMS

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GTIB-30
Installation Manual

www.princetonpower.com
4411-0011, Rev 1.7
Septemer 11, 2013

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About This Manual

Purpose

The purpose of this Installation Manual is to provide explanations and procedures for installing and troubleshooting the GTIB-30.

Scope

This manual provides safety guidelines, detailed planning and setup information, procedures for installing the inverter, as well as information about troubleshooting the unit. It does not provide details about particular brands of batteries.

Audience

This manual is intended as guidance for installing the GTIB-30. Installers are required to be certified technicians or electricians.

Organization

This manual is organized into five chapters and two appendices.

Chapters

Chapter 1 *Introduction* welcomes the user and provides background information about the GTIB-30 Inverter and Princeton Power Systems.

Chapter 2 *System Overview and Configurations* provides general information about the GTIB-30 and introduces several of the important system components. This section can also be found in the user manual of the GTIB-30.

Chapter 3 *Pre-Installation* provides important information regarding enclosure transport, placement and dimensions.

Chapter 4 *Wiring Instructions* contains instructions on how to wire up the GTIB-30.

Chapter 5 *Commissioning Sequences* provides a non-exhaustive wiring checklist and commissioning sequence for the GTIB-30 inverter.

Appendices

Appendix A provides the technical specifications of the GTIB-30.

Appendix B, “Return Material Authorization, Product, and Contact Information” This chapter provides instructions for obtaining a Return Material Authorization, if the product needs to be returned to Princeton Power Systems or one of its authorized service centers.

Abbreviations and Definitions

The following table provides a glossary of technical terms used in this manual. The glossary also defines some common electrical terms and acronyms that may be used in this manual.

Abbreviations	Definition
AC	Alternating Current
ATS	Automatic Transfer Switch
BMS	Battery Management System
CEC	California Energy Commission
DC	Direct Current
DPDT	Double Pole Double Throw
ESD	Electro-Static Discharge
GFDI	Ground Fault Detector and Interrupter
GTIB	Grid-Tied Inverter and Battery Controller
HMI	Human/Machine Interface

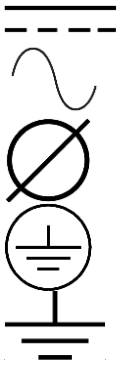
Abbreviations	Definition
I/O	Input/Output
IEEE	Institute for Electrical and Electronics Engineers
MPPT	Maximum Power Point Tracking
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
PCB	Printed Circuit Board
PPS	Princeton Power Systems
PSU	Power Supply Unit
PV	Photovoltaic
SPDT	Single Pole Double Throw
SPST	Single Pole Single Throw
THD	Total Harmonic Distortion
UL	Underwriters Laboratories
VPC	Volts Per Cell

Important Safety Instructions

SAVE THESE INSTRUCTIONS– This manual contains important instructions for the GTIB-30 that shall be followed during installation and maintenance of the inverter.

Symbols

The following is a list of symbols used in this manual and on labels in the GTIB-30 kW.



DC circuit

AC circuit

Phase indicator

Protective earth ground.

Other grounding conductor.

Warning Symbols used in this manual

Attention: This symbol identifies information about circumstances or practices that could lead to personal injury, death, internal component damage, reduced product life, equipment damage, economic loss, or other adverse effects.

Shock Hazard: This symbol identifies information about a condition or procedure that could be potentially lethal or harmful to personnel or damaging to components due to live voltages within the system, components holding stored energy, or electrostatic discharge (ESD).

General Precautions

Maintenance by Qualified Personnel: Only personnel familiar with the Princeton Power GTIB-30 Inverter and associated machinery should attempt installation, commissioning, or maintenance of the system. Untrained or unauthorized personnel run the risk of grave personal injury, death, or equipment damage. These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that specified in the operating instructions unless you are qualified to do so. Use appropriate tools only and wear appropriate protective gear. Remove all conductive jewelry when working on the inverter (e.g. rings, watches and other metal objects). Ensure that all tools, paperwork, and other foreign objects not designed for use in the Inverter are removed from the enclosure prior to closing the door and re-energizing the equipment.

High Voltage Electric Shock Hazard: The Princeton Power GTIB-30 Inverter and equipment connected to it, contains electrical components carrying potentially lethal voltages and currents. Extreme caution should be exercised around the system, especially when the cabinet door is open. Before opening the cabinet, all supply power and loads, including all DC sources (batteries and PV arrays) should be disconnected externally using a standard physical lock-out procedure and the service personnel should wait 5 minutes prior to opening the enclosure door to allow internal components to discharge. Note that a PV array must always be disconnected when performing maintenance, even in no-light conditions. Avoid hazardous voltage situations that could result from unsafe conditions such as, but not limited to, the following:

- Back-feed from the utility
- Improper grounding
- Handling electrical leads or devices with wet hands or on wet ground
- Frayed electrical leads
- Working with or on an electrically hot system or component, or when connected to an energized load
- An ungrounded battery pack
- Improper connection or re-connection of the terminal leads
- Short circuits
- Energized normal and emergency power sources

Installation to Code: The following instructions are merely a guide for proper installation. The National Electric Codes (NEC), local codes, and similar standards outline detailed requirements for safe installation of electrical equipment. Installation must comply with specifications for wire types, conductor sizes, electrical and thermal insulation, branch circuit protection, grounding, and disconnect devices. Princeton Power Systems cannot assume responsibility for compliance or noncompliance to any national or local code. Princeton Power Systems cannot assume responsibility for personal injury and/or equipment damage exists if codes are ignored or misapplied during installation.

CAUTION: To reduce the risk of fire, connect each AC circuit of the inverter only to a circuit provided with branch-circuit over-current protection in accordance with the National Electrical Code, ANSI/NFPA 70 and the instructions in this manual. (See **Table 3: AC and DC Overcurrent Protection Rating Requirements** in the Wiring Instructions section of this manual).

Improper Use: Princeton Power Systems cannot assume responsibility for personal injury and/or equipment damage as a result of improper installation, use, maintenance, reconfiguration, reprogramming, or other improper actions. An incorrectly serviced or operated Inverter system can cause personal injury, component damage, or reduced product life. Malfunction may result from wiring errors, an incorrect or inadequate DC supply or AC grid connection, excessive ambient temperatures or obstructed ventilation, or incorrect software configuration. Keep the door closed at all times when operating the system. Additionally, keep all guards, screens, and electrical enclosures in place when the system is operating. Close the inverter enclosure and put all guards and screens in place before energizing the unit.

Heat Hazard: The cabinet should not be mounted on a combustible surface nor should combustible materials be placed on or against the cabinet. The system should not be installed in a confined space that prevents proper ventilation or allows the build-up of excessive heat. A minimum of 12 inches of spacing clearance must exist for proper cooling airflow into and out of ventilation openings. Keep vents and air outlets clear of debris and provide proper airflow. Do not place or store any objects on the enclosure roof

ESD Sensitive Components: The inverter contains Electrostatic Discharge (ESD) sensitive components. Standard ESD control precautions must be followed when installing, commissioning, testing, servicing, or repairing the system. Component damage, component degradation, or an interruption in control system operation may occur upon an electrostatic discharge event. Use anti-static wristbands when servicing electronic components.

Locked Doors: The inverter enclosure should remain locked at all times during normal operation and should only be unlocked for maintenance by qualified personnel. Enclosure keys should be stored in a safe place and should be accessible to appropriate personnel only.

Electrical Connections: Be sure that all electrical connections and connectors are properly installed and connected with proper torque.

Fuses: For continued protection against risk of fire, only use replacement fuses of the same type and rating as the original fuse. Replacing of fuses should be done by knowledgeable and trained personnel only.

Tipover: Tip over hazard. Do not move this equipment without mechanical assistance.

Safety Check

Performing a routine safety check before energizing the Inverter will minimize the risk of injury to the operator and minimize the potential for damaging the unit.

Before operating the unit, check for obvious signs of damage or concern. The following is a list of suggested items to be checked before operating the unit:

1. Check the enclosure for obvious signs of damage.
2. Verify that all inlet and outlet vents are clear of debris.
3. Check external wires and cables for signs of damage, such as fraying or cracked insulation.
4. Check room for potential hazards, such as standing water on the floor or on the GTIB-30 Inverter.

Note: Additional safety checks may be necessary depending on the particular installation of the unit. The safety checklist above is not intended to be all-inclusive.

Resolve all issues before operating the inverter. Contact Princeton Power Systems if necessary.

Terms of Use

Because of the wide variety of uses for power electronics equipment, this manual does not describe every possible application or configuration. All technicians responsible for installing, commissioning, and operating this equipment must satisfy themselves of the suitability and proper implementation of the intended application of this power conversion product.

In no event will Princeton Power Systems, Inc., its subsidiaries, partners, employees, or affiliates be responsible or liable for any damages, indirect or direct, resulting from the misuse or incorrect application of this equipment.

The examples and diagrams in this manual are for illustrative purposes only. Because of the wide variety of uses, applications, peripheral equipment, and facility configurations particular to each installation, Princeton Power Systems, Inc. cannot assume responsibility or liability for actual use based on the information provided herein.

Battery Information

This system is designed to be operated with a variety of battery types and voltage. Battery voltage and current ratings must comply with the DC port ratings outlined in Appendix A.

WARNING: The battery charge control function has adjustable battery charging settings. The user must confirm that the charge control profile used in this inverter is appropriate and safe for the type of battery used and that all battery charging settings are set correctly for the battery voltage, current, and temperature ratings. Setting these settings incorrectly may damage the battery and the inverter and may cause a hazardous condition that puts personnel at risk of grave injury or death.

WARNING: Consult the battery manufacturer for information regarding safe transport, storage, operation and maintenance of batteries. Although this manual contains some information regarding battery safety but it is by no means exhaustive.

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1 Introduction

1.1 Congratulations

Congratulations on purchasing one of the most advanced inverters in the world, from one of the leading power electronics companies in the world. The GTIB-30 Inverter meets Underwriter's Labs' standard 1741 to allow power export to the North American electric grid. It is compatible with multiple input sources, including solar arrays with advanced maximum power point tracking (MPPT), battery banks, and generators.

The GTIB-30 is highly reliable, efficient, and flexible. It is backed by a world-class team of engineers at Princeton Power Systems that can ensure the technical and financial success of your application.

1.2 PPS Company information

Princeton Power Systems designs and manufactures advanced power conversion products and systems to provide customers with cost-effective, reliable, smart distributed generation. Our patented technologies, including AC-link™, produce clean electric power simply and efficiently, and our capable and flexible engineering team works closely with our customers to solve their problems. Customer solutions include grid-integrated distributed generation, renewable energy, energy storage, and military power supplies for Navy and Army applications.

2 System Overview and Configurations

2.1 System Overview

The GTIB-30 is an extremely versatile state of the art multi-port energy management converter system. The GTIB-30 can be connected to batteries, solar PV arrays, and utility grids. Unlike most conventional inverters and renewable energy systems, the GTIB-30 is designed to support and strengthen the utility grid instead of being a burden on it. It is therefore compatible with next generation smart and micro grids. These new power systems enable a much higher penetration of renewable energy than conventional inverter systems would allow and therefore the GTIB-30 helps to facilitate technical solutions to some of the world's most urgent environmental problems.

In an on-grid application, the loads connected to the GTIB-30 Load Port are supplied directly from the utility (as long as the grid is available). When the GTIB-30's DC port is configured for bi-directional power exchange with a DC power source or DC energy system, it charges its batteries from the utility grid. When the batteries are full, the GTIB-30 supplies all of the energy to the loads. At any stage, the operator can request the GTIB-30 to provide additional energy and supplement the utility grid by feeding energy from the batteries into the grid. (See User Manual) When the DC Port is configured for PV operation, the GTIB-30 can draw power from a connected PV array and supply it to the loads or optionally export it to the grid.

Additionally, the GTIB-30 also allows solar PV energy to be supplemented with combustion generators and other AC sources.

2.1.1 Power Ports

The GTIB-30 Inverter has one DC port (battery or PV) and one or two (optional) AC power ports (grid and load) giving the GTIB-30 a total of three power ports. In this manual, the GTIB-30 is often symbolically represented by a diagonally divided square where one half represents the AC ports and the other half represents the DC port (battery or PV). This symbolic representation of the GTIB-30 is shown in the center of Figure 1.

2.1.1.1 DC Port

The DC port can be either used for a battery bank or for connecting a PV array to the GTIB-30. The battery port is a two wire DC port used to connect a battery bank to the GTIB-30. The PV Port is a two wire DC port used to connect a PV array to the GTIB-30.

2.1.1.2 Load Port (Optional)

The load port is a four-wire AC port with three phases and a neutral line. This port is used to connect local loads to the GTIB-30. For example, by connecting to this port, the system may limit the loading on the utility supply (peak load shaving) by supplementing power from energy stored in batteries connected to the DC Port.

2.1.1.3 Grid (Source) Port

The grid port is a four-wire AC port with three phases and a neutral line. This port can be connected to the utility grid. If no utility grid is available, suitable AC generators can also be connected to this port.

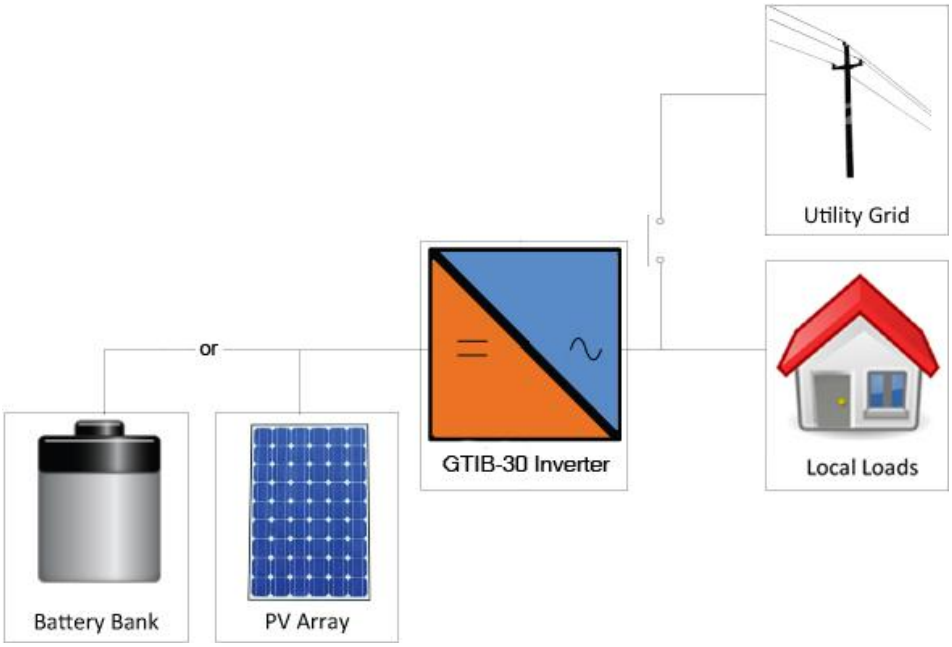

Figure 1: Symbolic single line diagram of GTIB-30.

2.1.2 Isolation Transformer

The GTIB-30 comes equipped with an internal isolation transformer. The isolation transformer provides electrical isolation between the DC and AC ports. The isolation transformer does not provide electrical isolation between the two AC ports if the load port option is installed.

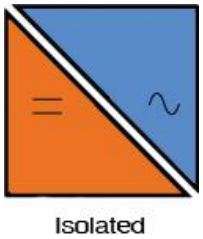

Figure 2: Symbolic representation of the GTIB-30 with isolation transformer.

2.1.3 Functional Power Block Diagram

A functional block diagram of the GTIB-30 power circuit is shown in Figure 3. This diagram provides information to the interested reader but does not need to be understood for successful installation.

The GTIB-30 consists of a single bi-directional DC-AC stage. An optional internal manual utility switch can be provided. (Figure 7) This internal switch is not the same as an external utility grid disconnect switch. An internal switch is provided on the DC port. (Figure 8) This is not the same as the external disconnect switch.

External disconnects are required on the battery bank or PV array.

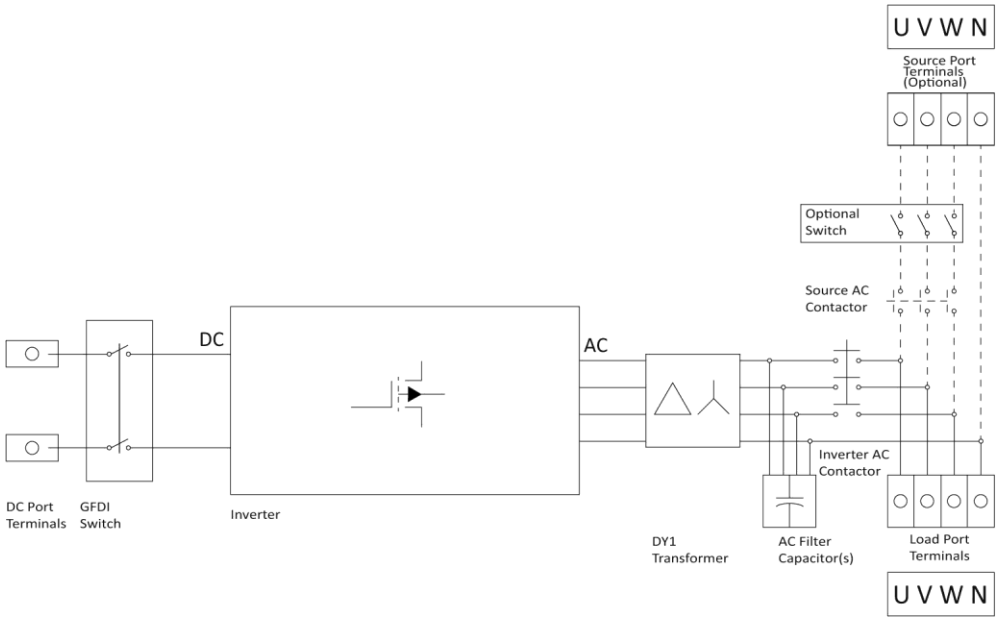

Figure 3: Functional power diagram of the GTIB-30.

2.1.4 Main System Components

Some of the main system components are introduced in this section. Only system components that are relevant for the installation are mentioned. Please refer to other GTIB-30 documentation for information regarding other system components.

2.1.4.1 Enclosure

The GTIB-30 is housed inside a NEMA 3R rated metal enclosure as shown in Figure 4. Instructions on how to open and close the enclosure are provided in Section 4.4, dimensions, placement and further enclosure related information are provided in Sections 3.2 and 3.3.

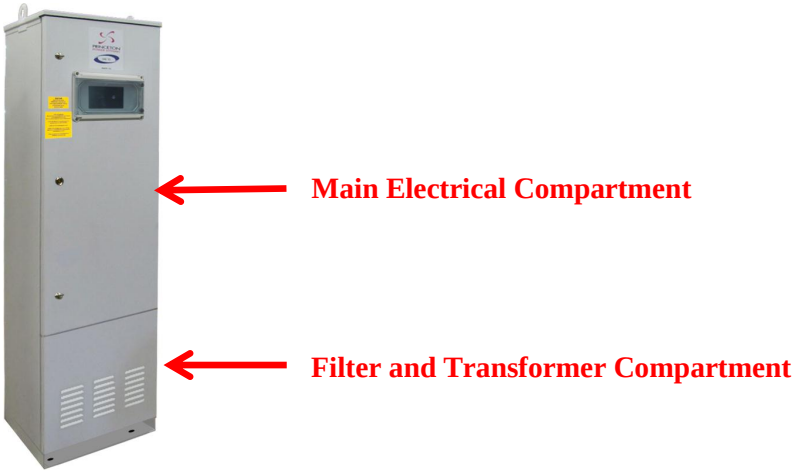

Figure 4: Closed GTIB-30 metal enclosure.

2.1.4.2 Human Machine Interface (HMI)

The GTIB-30 is controlled via a state of the art touch screen HMI which is installed on the front door of the GTIB-30 metal enclosure. The HMI is covered by a clear plastic cover which can be hinged open to operate the inverter.

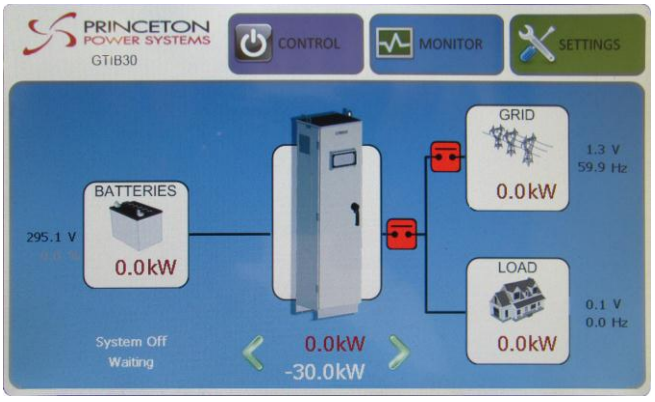

Figure 5: Touch Screen HMI mounted in front door of GTIB-30 enclosure.

2.1.4.3 Interior

Once the enclosure front door is opened, the user has access to several switches on a control panel and to the user control interface section (at the top of the enclosure).

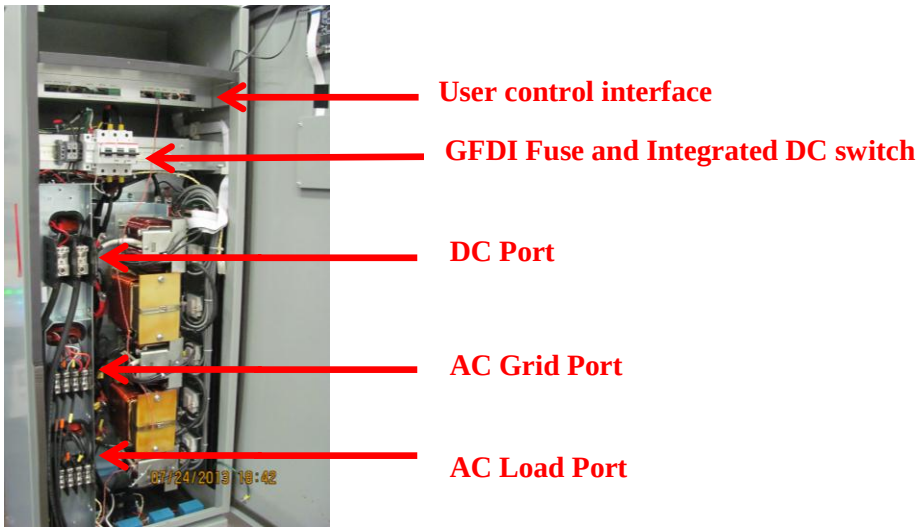

Figure 6: View of GTIB-30 enclosure when front door is opened.

2.1.4.4 Integrated Grid Overcurrent Switch (Optional)

The GTIB-30 may contain an optional integrated overcurrent switch that can be used to connect and disconnect the Grid Port from parts of the GTIB-30 system. The electrical location of this three-phase overcurrent switch is shown in the functional power block diagram in Figure 3 in Section 2.1.3. This switch is open when the switch is in down position (as shown in Figure 7), tripped when in the center position and closed when in the up position.

External disconnects on the AC port(s) are still required on any installation.

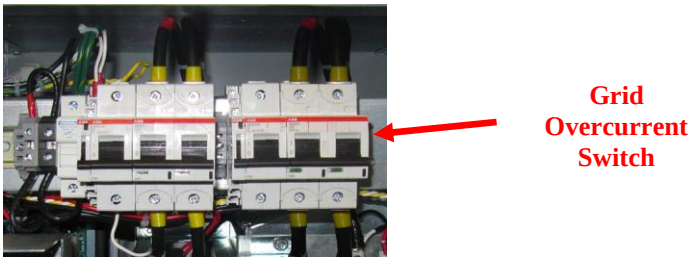

Figure 7: Picture of GTIB-30 Control Panel showing optional Grid Overcurrent Switch.

2.1.4.5 Integrated DC Switch

The GTIB-30's integrated battery (DC) switch is shown in Figure 7. The electrical position of this switch is shown in the functional power block diagram in Figure 3 in Section 2.1.3. This switch is open when the switch is in down position, tripped when in the center position (as shown in Figure 8), and closed when the switch is in the up position.

The integrated DC switch must always be in the off (disconnected or down) position before the external battery disconnect is closed. Failure to do so will cause damage to the GTIB-30. The GTIB-30 is equipped with a pre-charge circuit that is always on. This means that the DC bus is always charged as long as the external disconnect is closed!

External overcurrent protection is required on the Battery Port (150 Amps Max). External DC disconnect is required.

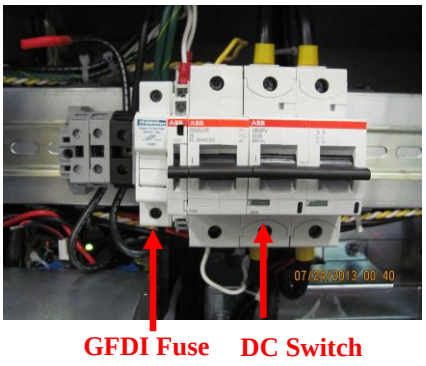

Figure 8: Picture of GTIB-30 control Panel showing DC switch in the tripped position.

2.1.4.6 Control Power and Sensing Fuse Locations

The GTIB-30's integrated Control Power Supply fuses are shown in Figure 9, Figure 10, and Figure 11.

Many of the fuses are located in the wiring tray behind the main power connection terminals. Never access these fuses while power is applied to the inverter.

The DC bus fuse must be pushed in to close it to the position shown in Figure 10.

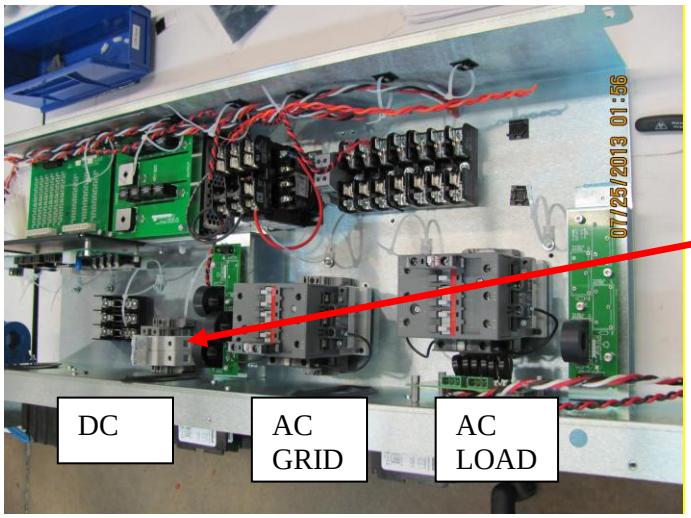

Figure 9: GTIB-30 Wiring tray.

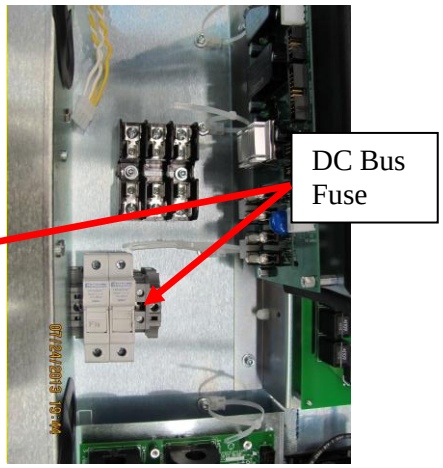

Figure 10: DC Bus fuse

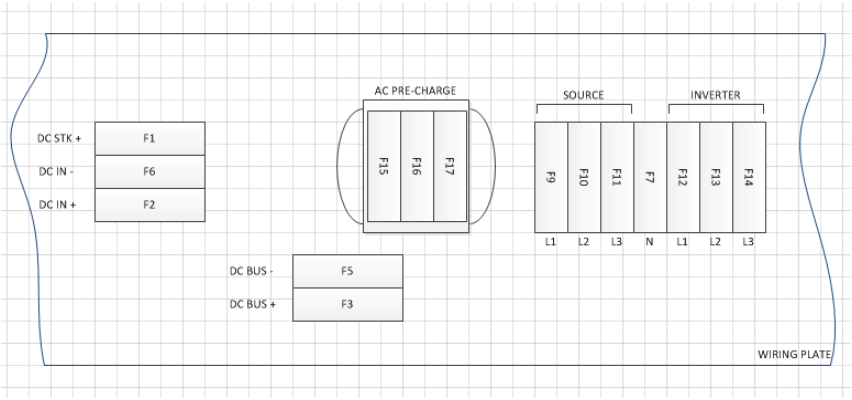

Figure 11: GTIB-30 Wiring Tray fuses.

Table 1: GTIB-30 Fuse List

Fuse	Description	Rating	Location
F1	DC STK+	1A / 600V	Wire Tray
F2	DC In +	6A / 600V	Wire Tray
F3	DC Bus +	44/100A / 1000V	Wire Tray
F4	GFDI	4A / 600V	Left of DC Breaker
F5	DC Bus -	44/100A / 1000V	Wire Tray
F6	DC In -	6A / 600V	Wire Tray
F7	Neutral	4A / 600V	Wire Tray
F8	Not Used		
F9	Source L1	4A /600V	Wire Tray
F10	Source L2	4A / 600V	Wire Tray

Fuse	Description	Rating	Location
F11	Source L3	4A / 600V	Wire Tray
F12	Inverter L1	4A / 600V	Wire Tray
F13	Inverter L2	4A / 600V	Wire Tray
F14	Inverter L3	4A / 600V	Wire Tray
F15	AC Pre-Charge	1A / 600V	Wire Tray
F16	AC Pre-Charge	1A / 600V	Wire Tray
F17	AC Pre-Charge	1A / 600V	Wire Tray
F18	GFDI PCB	3/10A / 600V	Top wire tray GFDI Bd

2.1.4.7 Enclosure Door

Never attempt to unlock and open the enclosure door while the GTIB-30 is running or any external disconnect switches are still closed. Wait at least five minutes after opening the last of the three external disconnect switch (grid port, load port, DC port) before proceeding opening the door.

2.1.4.8 Main User Power Terminal Blocks

Once the enclosure door is opened, the user can access the main power connection terminals of the GTIB-30. These terminals are shown in Figure 12.

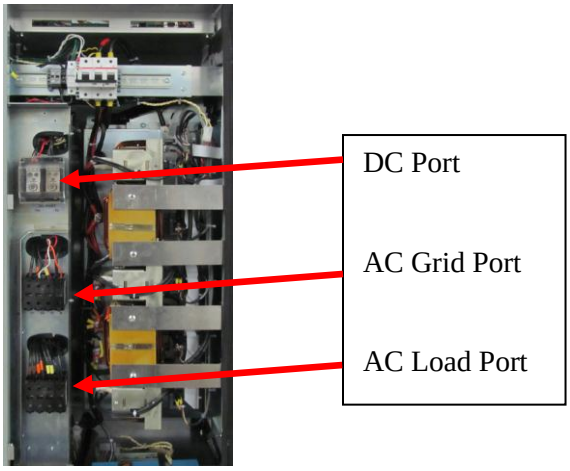

Figure 12: Main Power Connection terminal blocks

2.1.4.9 Enclosure Air Filter

The bottom compartment of the GTIB-30 is covered by a vented panel secured by screws. This bottom compartment contains the air filter and the transformer for the enclosure. Air is drawn into the GTIB-30 via the vented cover, through the filter to remove particles, and then flows up into the main electrical compartment where it circulates as shown in Figure 13. The air then exhausts out through the vents in the right side of the upper compartment. The two sections in the lower part of that compartment are separated by a clear panel to direct the air flow. The filter should be changed periodically. See Appendix C of the GTIB-30 User Manual for instructions.

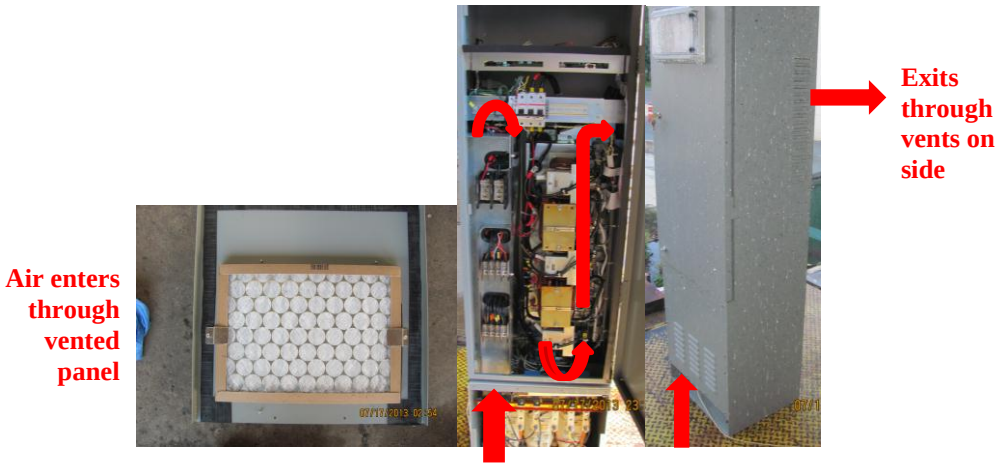

Figure 13: Picture of GTIB-30 showing air flow (bottom front panel removed to show filter).

2.2 Power Format

The GTIB-30 inverter AC ports work with a three-phase power format. Both AC ports have four wire connections, three live wires and one neutral wire.

The GTIB-208-30 is compatible with a conventional three-phase 208V supply power format. The GTIB-480-30 is compatible with conventional three-phase 480V. By measuring the voltages between any three line wires using a multi-meter and comparing them to the values in Table 2, it is possible to verify if the power format being used is a 208V/480V three-phase power format.

2.2.1 Three-phase Power Format

In this power format, the three phases are 120 degree phase shifted with a magnitude of 120Vrms or 277Vrms each and a frequency of 60Hz. This power format is summarized in Table 2.

Table 2: Summary of three-phase power format.

	GTIB-208-30	GTIB-480-30
Frequency	60Hz	60Hz
Phase to Neutral Voltage	120Vrms	277Vrms
Phase to Phase Voltage	208Vrms	480Vrms

2.3 GTIB-30 Configuration Options

This section provides a brief overview of how the GTIB-30 can be connected to other system components. The possible configurations are:

1. Load Port Option
2. GFDI Option (negative-grounded)
3. DC Port Usage (PV/Battery) Option
4. AC Grid Port Overcurrent Switch

For more detailed information, please refer to Chapter 4.

The Grid-Tied configuration is shown schematically in Figure 14. It is highly recommended that an external bypass switch is installed which is interlocked with the external grid and load disconnect.

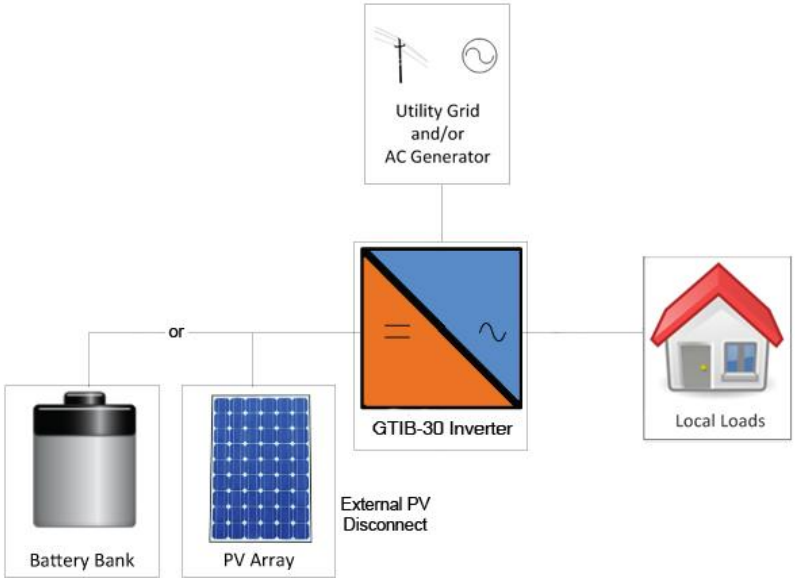

Figure 14: Single line diagram of GTIB-30 in Grid-Tied configuration.

2.4 Important System Specifications

Refer to Appendix A for specification information. Of particular importance are the port specifications which must be taken into careful consideration for system sizing and useful during the installation process.

2.4.1 Isolation Transformer

The GTIB-30 includes an isolation transformer. The transformer provides electrical isolation between the AC and DC ports as explained in Section 2.1.2 and allows grounding of the DC ports. The position of the transformer in the GTIB-30 enclosure is shown in Figure 15. Note that the bottom front panel and the air filter have been removed.

Figure 15: Position of the internal isolation transformer in the GTIB-30 enclosure.

3 Pre-Installation

3.1 Unpacking, Inspection, and Storage

Upon receiving the unit, inspect for signs of damage that may have been caused during shipping. If damage is found, immediately contact Princeton Power Systems and the Shipping Company.

The inverter weighs approximately 560 lbs. (254 kg). Use a forklift or pallet jack to move the unit. Do not attempt to lift and/or move the inverter by hand. Attempting to move the unit by hand may lead to serious injury.

CAUTION: Tip over hazard. Do not move this equipment without mechanical assistance. Use caution when working around equipment that has not been securely mounted to mounting pad.

3.2 Dimensions

3.2.1 Outer Dimensions

The outer dimensions of the GTIB-30 unit are shown in Figure 16.

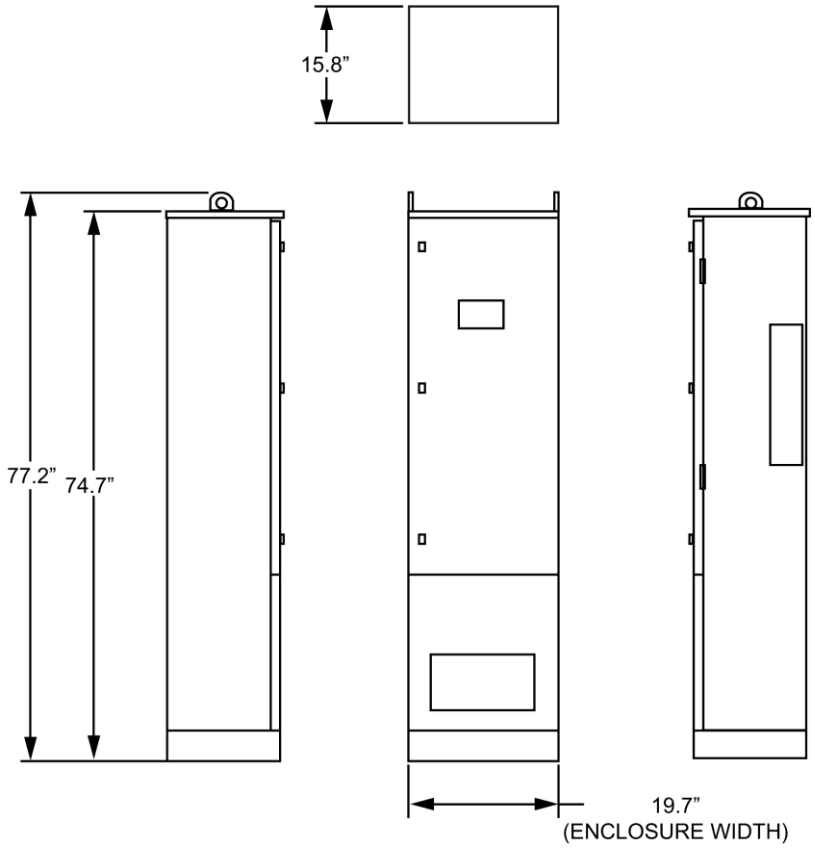

Figure 16: Outer dimensions of GTIB-30 inverter

3.2.2 Pad Mounting

The GTIB-30 must be anchored to the floor. Mounting holes are located in the mounting plates of the GTIB-30. The inverter **is required to be mounted** to a mounting pad to prevent accidental tipping of the unit.

The exact positioning of the mounting holes is shown in Figure 17.

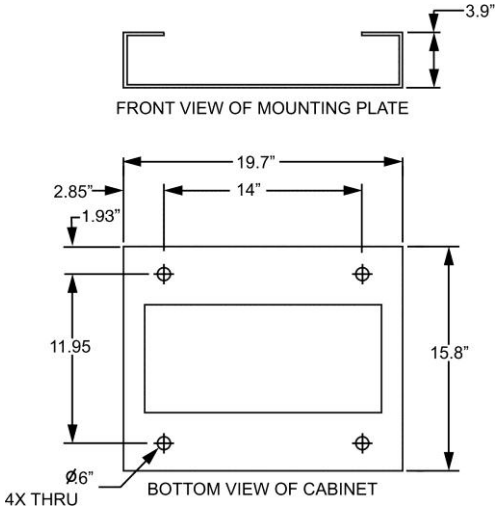

Figure 17: Front view of GTIB-30 Mounting plate and Bottom view of Enclosure (showing position and dimensions of mounting holes).

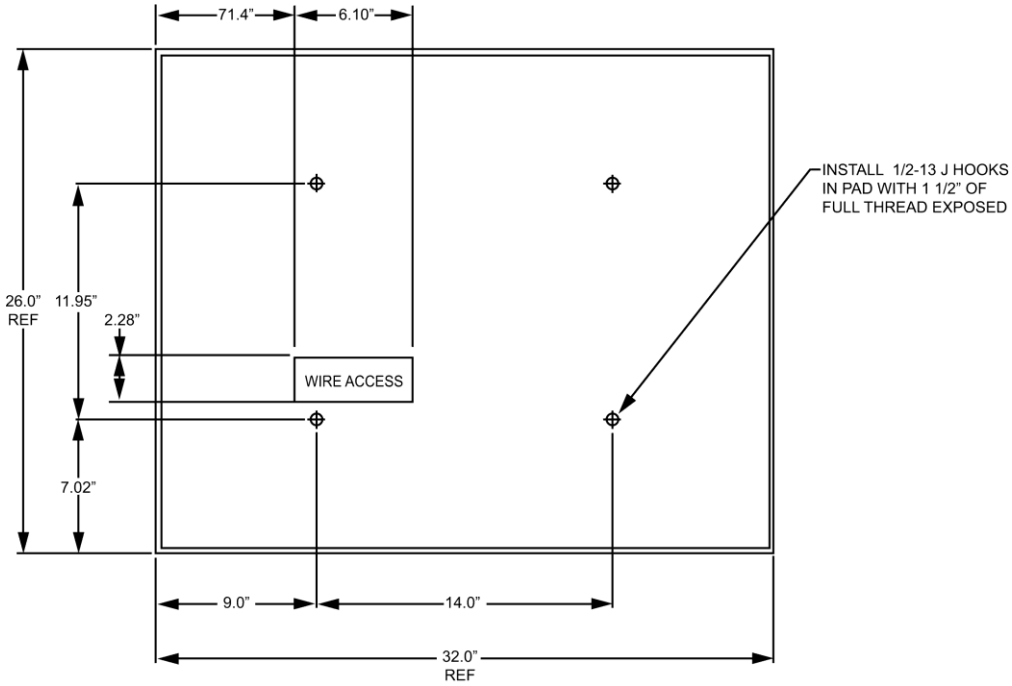

Figure 18: Suggested Mounting Pad Layout for GTIB-30 Installation.

3.3 Inverter Placement Considerations

Although the GTIB-30 inverter is designed to be as efficient as possible, some heat is inevitably generated by the unit. The GTIB-30 needs to be installed in such a manner that hot air generated by the unit can escape.

The entire enclosure is used to dissipate waste heat. At high power, the temperature of the entire enclosure will therefore increase significantly. Hot spots on the enclosure may reach up to 140 degrees Fahrenheit (60 ºC). Ensure that no temperature sensitive objects are close to or touching any part of the inverter enclosure at any time. Also ensure that small children are unable to access the area where the inverter is stored.

Hot air is designed to escape from the inverter through the ventilation louvers on the right side of the inverter which is shown in Figure 19.

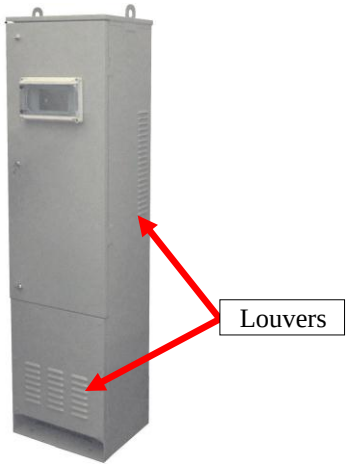

Figure 19: GTIB-30 View showing ventilation louvers.

For optimal performance, please ensure that these ventilation louvers are not blocked by surrounding objects or walls.

Under no circumstances, should the right side of the inverter be moved directly up against a wall or other object. This will prevent air flow through the ventilation louvers and will also prevent the enclosure door from opening.

For optimal performance, it is recommended to leave as much open space around the inverter as possible for optimal natural cooling. The minimum space requirement on the right and the front of the GTIB-30 inverter for full power capability is 12 inches.

The following is a list of the above requirements and other considerations that should be taken into account in order to get the most out of the GTIB-30 inverter:

1. Mount the enclosure away from heat sensitive equipment and/or objects, since the enclosure heats up considerably during operation
2. Ensure that the ventilation louvers on the right and the front of the enclosure are not obstructed.

3. Ensure that the enclosure is free standing and the space requirements are complied with.
4. The enclosure is NEMA 3R rated and can be installed INDOORS or OUTDOORS.
5. The maximum life of the inverter can be achieved by mounting the unit in a clean, dry and cool location
6. For optimal inverter life and performance, do not mount the inverter in direct sunlight, especially in hot climates.
7. The installation location should be sufficiently ventilated to prevent the inverter heat output from increasing the ambient temperature beyond the inverter's rating.
8. Under certain operating conditions, the inverter will emit audible noise; it is not advisable to install in the immediate vicinity of living quarters.
9. The inverter should not be installed in an area that is excessively dusty, as this may decrease the performance of the air cooling system.
10. The inverter must not be installed in areas in which dust containing conductive particles (e.g. iron filings) may form.
11. When installing the inverter, care should be taken to ensure that the display unit remains at or below eye level.
12. Provisions should be made and/or procedures should be in place to ensure that nothing is placed or stored to the right of the enclosure that could block the ventilation louvers or prevent the enclosure door from being opened.
13. The inverter weighs about 560 lbs. (254kg.) Verify load capacity of mounting area.
14. Never mount the inverter any other way but upright.

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4 Wiring Instructions

4.1 Preparing for the Installation

4.1.1 Installation Tools and Materials Tools Required

1. Wire strippers
2. Assorted open-end wrenches or socket wrench set and fittings
3. Torque wrench
4. Electrical tape
5. Multi-meter (AC/DC Voltage up to 600V)
6. Assorted Phillips screw drivers
7. Allen/Hex head driver set (through 1/2")
8. Slotted screw driver
9. Level
10. Pencil
11. Utility knife
12. Knockout punch for installing wires through gland plate.
13. Assorted Rubber grommets to dress wire holes in gland plate.

The following materials may be required for completing this installation:

1. Conduits (code compliant conduit is recommended), bushings, wire nuts, appropriate fittings for wire run, and seals as necessary.
2. Electrical wire of appropriate size and length (see Tables 3 and 4).
3. Breaker panels (if used)
4. Additional AC and DC disconnect and overcurrent switches / protection (see Table 3 for required ratings).
5. Ground busses, bars, and/or rods
6. Ferrules on all wire ends

4.2 Safety

WARNING: Shock Hazard: Ensure that all three ports are disconnected from the unit via external disconnect switches before performing any maintenance or installation. Ensure that no port can be reconnected during installation or maintenance by employing standard lock out procedures. Please note that the load port must also be disconnected since other power sources might connected to the load port. Wait at least 5 minutes after disconnection before commencing with work on the unit. Failure to comply with the above requirements could cause serious injury or death.

A warning label is provided to inform all personnel that multiple sources of power are available inside. This label is installed on the outside of the door and should remain clearly visible. Ensure all energy sources are disconnected before servicing.

Before connecting the solar panels, check that the voltage specified by the manufacturer corresponds to the actual measured voltage. At an outside temperature of -10°C[1], the open-circuit voltage for the solar panels should never rise above 600 V. When the temperature is lower, the open-circuit voltage generated will be higher than normal. The temperature coefficients for calculating the open-circuit voltage at -10°C can be found in the data sheet for the solar panels. If the open-circuit voltage for the solar panels rises above 600 V, this may result in damage to the inverter and all warranty rights shall be declared null and void. Damage to the inverter may cause a hazardous condition that puts personnel at risk of grave injury or death.

WARNING: The battery charge control function has adjustable battery charging settings. The user must confirm that the charge control profile used in this inverter is appropriate and safe for the type of battery used and that all battery charging settings are set correctly for the battery voltage, current, and temperature ratings. Setting these settings incorrectly may damage the battery and the inverter and may cause a hazardous condition that puts personnel at risk of grave injury or death.

AC Grounding: All input and output circuits are isolated from the enclosure. System grounding, when required by Sections 690.41, 690.42, and 690.43 of the National Electric Code (NEC), ANSI/NFPA 70, is the responsibility of the installer.

DC Grounding: The DC negative is ground if the GFDI option is installed. See Section 4.11.1.

[1] In extreme locations, it might be necessary to use even lower temperature value. Contact Princeton Power System if you are using a PV system in extremely cold but sunny conditions.

4.3 External disconnect and overcurrent protection requirements

For safe installation, operation and maintenance, it is required that external disconnect switches and overcurrent devices be installed on all ports of the GTIB-30 (See Table 3 for required ratings). It is highly recommended that all disconnect switches are installed in a single neat enclosure or bypass box in close proximity to the GTIB-30 inverter. All switches inside the bypass-box should be appropriately labeled and the necessary warning labels must be included. Circuit breakers can be used as disconnect switches. These then provide both over current protection and also function as disconnect switches.

DC disconnect switches must be used on the DC ports. External overcurrent protection is required for Battery or PV operation. See Table 3 for ratings.

4.3.1 AC Disconnect switch requirements

The external disconnect switches on the utility grid and load port as well as any bypass switches need to break all phases and leave the neutral unbroken to be fully compliant with NEC requirements.

4.3.2 DC Disconnect switch requirements

The DC port (battery or PV) must be equipped with external two pole devices that enable disconnection of the DC source or load. In most cases, the combiner box of the PV array will provide this capability for the PV port. Many battery banks will also provide a disconnect device in which case another external disconnect device on the battery port is not needed.

If the GTIB-30 is equipped with the optional GFDI, the external disconnect must only break the ungrounded conductor. If the GTIB-30 does not have the optional GFDI or there is an external GFDI installed it is up to the contractor / installer to decide how to wire the disconnect as to not defeat the GFDI circuit.

Table 3: AC and DC Overcurrent Protection Rating Requirements

Connection	GTIB-208-30	GTIB-480-30
Grid Port	100A	50A
Load Port (if installed)	100A	50A
DC Port	150A	150A

4.4 Opening the enclosure

4.4.1 Opening enclosure door

The GTIB-30 enclosure front door is locked by a key lock and a top and bottom twist lock, shown in Figure 20. The locks are only to be unlocked by a qualified electrician or technician who is performing the installation or periodic maintenance. Once the locks are unlocked and the front enclosure door can be opened.

Figure 20: Enclosure with lockable handle.

4.5 Wire Sizing and Ratings

All wiring installed in the system must be rated for 600VAC, including control and signal wiring.

Installation to Code: The following instructions are merely a guide for proper installation. The National Electric Codes (NEC), local codes, and similar standards outline detailed requirements for safe installation of electrical equipment. Installation must comply with specifications for wire types, conductor sizes, electrical and thermal insulation, branch circuit protection, grounding, and disconnect devices. Princeton Power Systems cannot assume responsibility for compliance or noncompliance to any national or local code. Princeton Power Systems cannot assume responsibility for personal injury and/or equipment damage exists if codes are ignored or misapplied during installation.

4.5.1 Power Conductor Sizing and Ratings

All AC and DC power and earth wiring, including grid port, load port, and DC port, should meet the following specifications:

Table 4: Minimum power port wire requirements

Voltage Rating	600 Volts or greater per NEC
Temperature Class	90°C or greater per NEC
Gauge	DC: copper, 3 AWG (6 AWG Earth GND) AC - 208V: copper,6 AWG (10AWG Earth GND) AC - 480V: copper, 8 AWG (10AWG Earth GND)

Also refer to Section 4.7 for ground wire requirements.

4.5.2 Control Wire Sizing and Ratings

The tables in this section provide a guideline for wire types that should be used for the different types of signal and control wiring.

Note: Class 1 wiring methods are to be used for all field wiring connections to a class 2 circuit.

4.5.2.1 Analog, Digital I/O and temperature sensor wiring

Refer to Sections 4.13.1 and 4.13.2 for more information.

Table 5: User I/O wire requirements

Voltage Rating	600 Volts
Temperature Class	75°C or greater
Gauge	Copper Stranded: 22 - 18AWG
Cable type	Shielded twisted pair recommended

4.5.2.2 Synchronization and Ethernet Wiring

Also refer to Section 4.13.4.2.

Table 6: Ethernet port wire requirements

Voltage Rating	600 Volts
Temperature Class	75°C or greater
Cable type	Standard 8 way Ethernet cable: shielding recommended

4.6 Wiring Terminals

All cables enter and exit the enclosure from underneath the plinth in the left front of the enclosure (see Figure 22). There are power cables for AC power wiring, DC power wiring and signal wiring respectively. A view of the power terminals is shown in Figure 21.

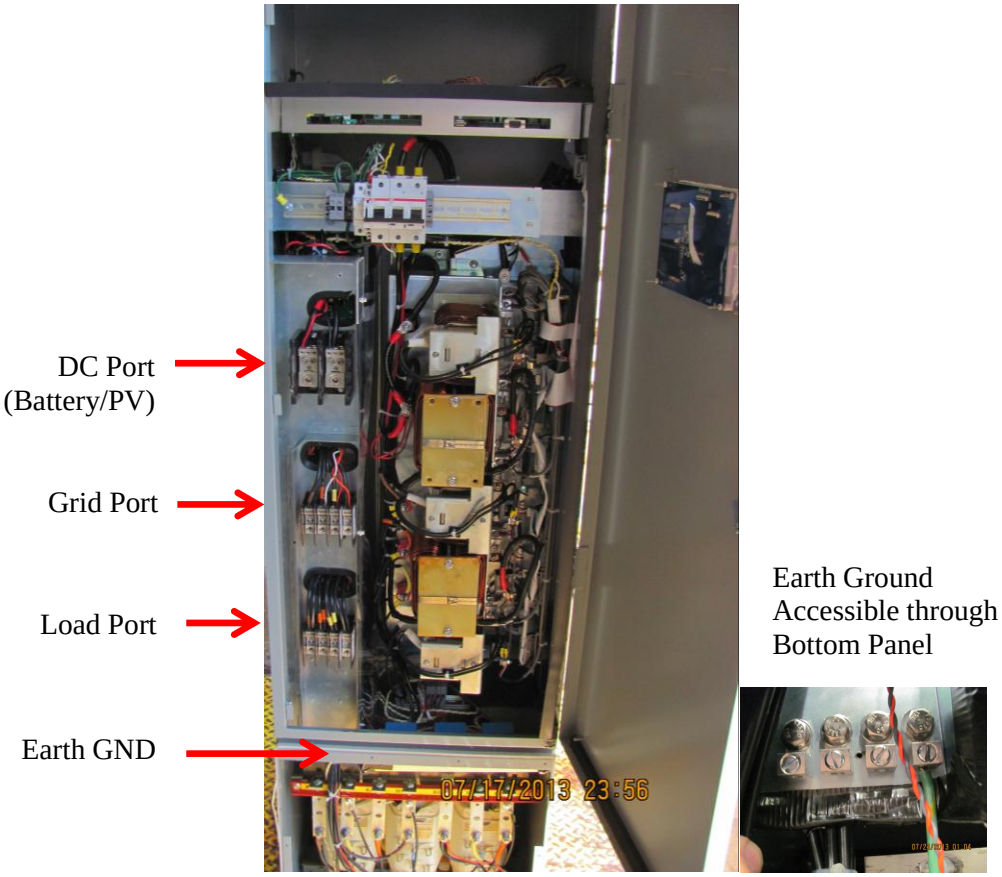


Figure 21: View of Terminal blocks for DC (PV/Battery) and AC power wiring.

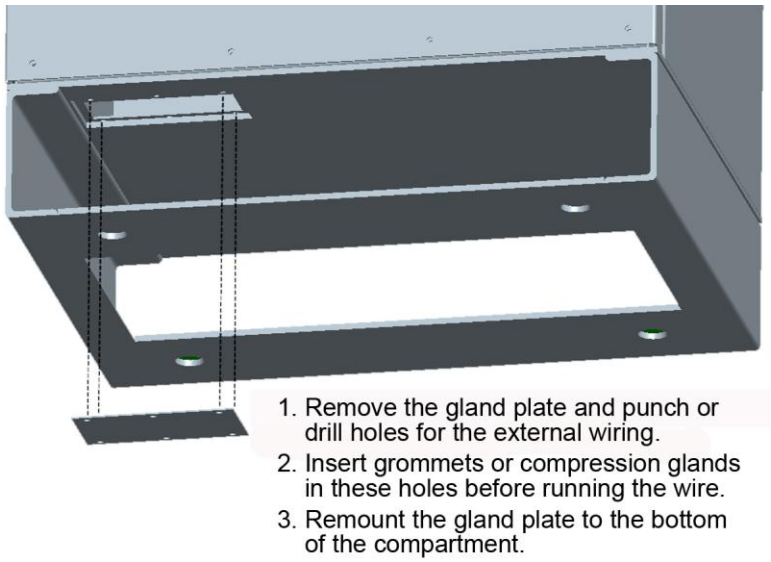

1. Remove the gland plate and punch or drill holes for the external wiring.
2. Insert grommets or compression glands in these holes before running the wire.
3. Remount the gland plate to the bottom of the compartment.

Figure 22: External wire routing into the GTIB-30

The gland plate must be properly installed to prevent the ingress of dust, small animals, and insects that may damage the system.

4.7 Earth Wiring

It is essential that the GTIB-30 is connected to protective earth ground of the premises. The GTIB-30 provides a special terminal for this connection (see Figure 20). Once this terminal is earthed, the internal wiring of the GTIB-30 will ensure that all parts of the enclosure and other touchable metal parts are properly shorted to the protective earth ground.

It is the responsibility of the installer to ensure that all grounding arrangements are NEC compliant before proceeding with the installation. PPS takes no responsibility for damage or injuries resulting from non NEC compliant grounding arrangements.

4.7.1 AC Circuit and DC Port earth wire requirements

For the AC circuits and the Battery configuration, a ground wire will be sized at least according to Table 7, based on the size of the over-current device protecting that circuit. Voltage and temperature requirements of Section 4.5.1 must also be considered.

The ground wire for the PV input will be rated for at least 1.25 times the rated short-circuit current of the installed PV array.

Table 7: Ground Wire Size Chart

Column 1	Column 2	
	Minimum size of equipment grounding or bonding conductor AWG or kcmil (mm)	
Maximum current rating in Amperes	Copper	Aluminum or copper-clad aluminum
15	14 (2.1)	12 (3.3)
20	12 (3.3)	10 (5.3)
30	10 (5.3)	8 (8.4)
40	10 (5.3)	8 (8.4)
60	10 (5.3)	8 (8.4)
90	8 (8.4)	6 (13.3)
100	8 (8.4)	6 (13.3)
150	6 (13.3)	4 (21.2)

4.7.2 Grounding in Grid-Tied configuration

If a grid is available on the premises, a protective earth connection must also already be available on the premises. The grounding arrangements of the premises must be checked for NEC compliance by qualified personnel before continuing with the installation. Note that it is generally not permissible to have separate earth connections on the same premises that are not electrically connected. Therefore, generally if a utility grid is available on the premises, the earth connection of that connection must be used.

4.7.3 Connecting to the Grounding terminal

Connect the GTIB-30 to the protective earth connection by feeding a (green or green/yellow marked) earth wire with the AC wires. Connect it to the earth terminal as shown in Figure 23. (Refer to Section **4.7.1 AC Circuit and DC Port earth wire requirements** for ground cable size requirements).

The earth wire must be insulated to prevent it from touching any of the exposed power terminals or the transformer.

WARNING: If the GFDI option is installed, the battery is negative-grounded to the chassis. See Section 4.11.1 for more information.

Earth Ground
Terminal Blocks

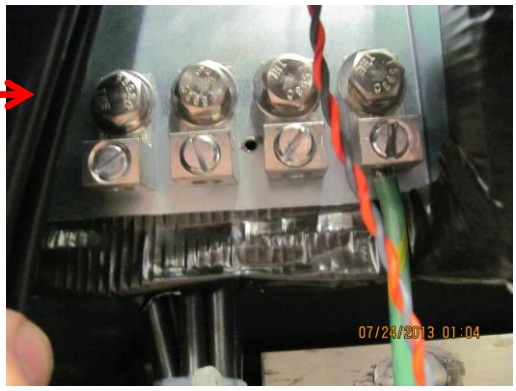


Figure 23: Main earth terminals inside enclosure with earth wire connected.

4.8 Torque Specifications of Power Terminal Blocks

All power wiring is done using the terminal blocks shown in Figures 21, 22, and 23. The AC terminal blocks can accommodate 18-6 AWG wire. The DC terminal block can accommodate 14-2 AWG. The Earth Ground terminal blocks can accommodate 14-4 AWG. Earth Ground wire should be sized in accordance with Section 4.7.1. During the wiring, all of the terminal block clamps should be tightened to 1.2-1.4 Nm / 10.6-12.4 lb.in.

4.9 Utility Grid (Source) Port Wiring

The GTIB-30 is a Grid-tied inverter and the utility grid must be connected to the unit. Wire requirements for this wiring are provided in Section 4.5.1.

Ensure that the utility is disconnected when connecting utility wires. Never attempt to connect live wires. Use standard lockout procedures to ensure the utility supply cannot be reconnected during installation.

The utility wires must be fed into the enclosure. Once inside the enclosure, the utility wires must be connected to the four terminal blocks marked as **U**, **V**, **W**, and **N** (if used) as shown below. U, V, and W, are live and N is Neutral.

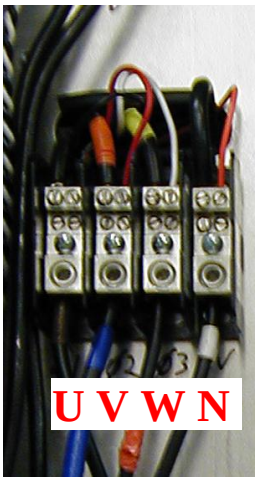


Figure 24: Grid port wiring connections.

Wires should be stripped a minimum of .55" (14mm) before inserting into terminal blocks.

It is important to ensure that the neutral wire (if used) is connected to **N** and not **U, V,** or **W**. A multi-meter and Table 2 can be used to determine which wire is the neutral wire should this information not be available. Ensure that supply is disconnected again after measurements are made before continuing with installation.

4.10 Load Port Wiring (if option is installed)

Load port cannot be active unless the Grid Port is connected to the Grid. Run three or four wires that are rated in accordance with Section 4.5.1, from the load port disconnect switch (see Figure 1) to the GTIB-30 terminal blocks as shown.

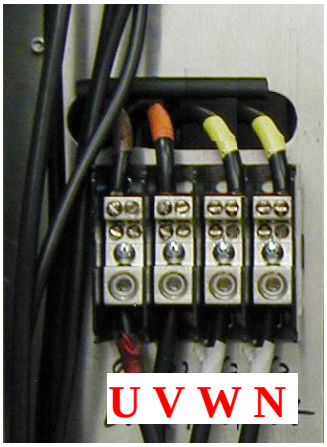


Figure 25: Load port wiring connections.

During the wiring all of the terminal block clamps should be tightened to 1.2-1.4 Nm / 10.6-12.4 lb.in.

Wires should be stripped a minimum of .55” (14mm) before inserting into terminal blocks.

Ensure that wires are not live and remain disconnected during installation. Never assume that there are no other sources connected to the load port.

Ensure that neutral wire is correctly connected to **N**, phase 1 wire is connected to **U**, phase 2 wire is connected to **V**, and phase 3 wire is connected to **W**. This is particularly important if the installation forms part of a larger installation where other energy sources might be connected to the load port.

4.11 DC Port Wiring

Run two wires that are rated in accordance with Section 4.5.1 from the Battery disconnect or the PV combiner box to the **DC-** and **DC+** terminal blocks inside the GTIB-30 as shown.

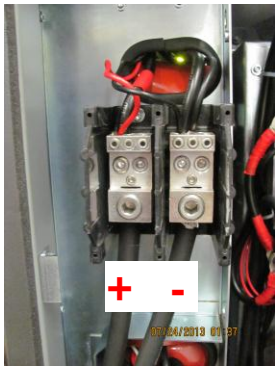


Figure 26: DC port wiring connections.

During the wiring all of the terminal block clamps should be tightened to 1.2-1.4 Nm / 10.6-12.4 lb.in.

Wires should be stripped a minimum of .55" (14mm) before inserting into terminal blocks.

It is essential that the polarity of the Battery or the PV array be correct. Use a multi-meter to check polarity if unsure. Ensure that Battery or PV array is disconnected again after measurements before proceeding with installation.

4.11.1 DC Port grounding

WARNING: For systems equipped with an optional integrated GFDI the (AC/DC circuit) Ground Terminals must NOT be used to ground either the positive or negative nodes of the input DC circuit. The GFDI circuit grounds the negative DC terminal to earth ground, and no other ground may be used to ground either the positive and negative nodes.

DC Input connects to a Battery:

If installing an ungrounded floating DC system, the GFDI option should not be installed as part of the GTIB-30. When the GFDI option is not installed, it is up to the installer to decide if the battery system should be floating, negative, center or positive grounded.

DC input connects a PV array:

All PV array frames should be grounded appropriately. The grounding wire of the PV frames should be done via the Earth Ground terminal shown in Figure 21. Connecting the PV array power connection to a different ground point will bypass the GFDI unit (if installed) in the GTIB-30 and is not recommended (see section 4.12 PV Ground Wiring).

WARNING: If the system is not equipped with an optional integrated GFDI, then this inverter must be used with an external GFDI device as required by the Article 690 of the National Electrical Code for the installation location.

The GTIB-30 has an integrated isolation transformer installed allowing for external grounding of the PV negative.

It is the responsibility of the installer to ensure that all grounding arrangements are NEC compliant before proceeding with the installation. PPS takes no responsibility for damage or injuries resulting from non NEC compliant grounding arrangements.

4.12 PV Ground Wiring

The terminal blocks used to ground PV negative are inside the GTIB-30 inverter (see below). Removing this jumper will effectively disable the optional internal GFDI protection circuit. If a floating PV array is installed an external GFDI needs to be installed and this jumper should not be in place.

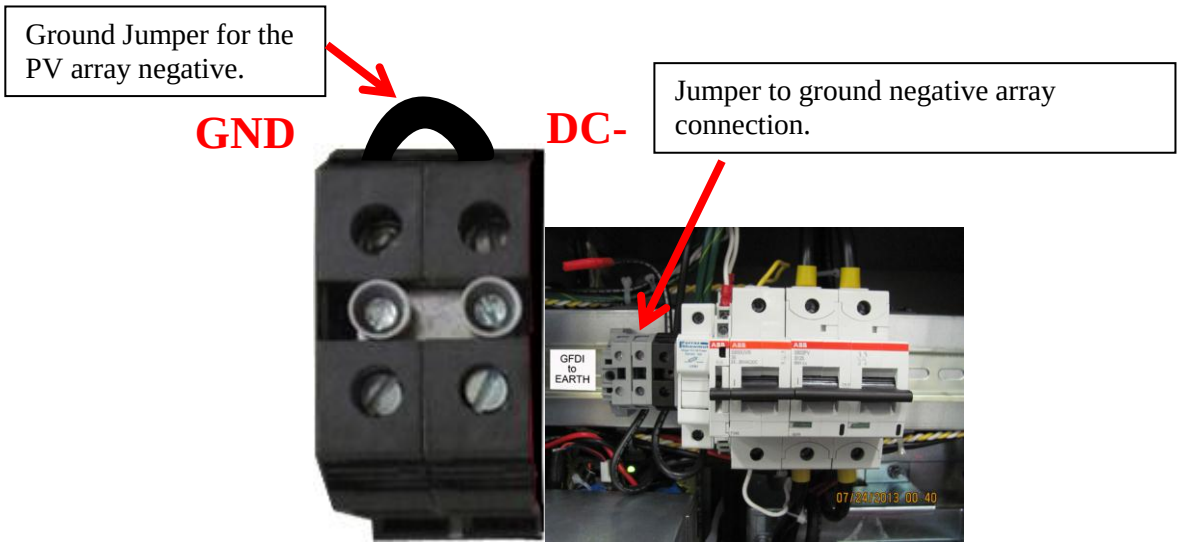


Figure 27: PV ground wiring connections.

4.13 Signal wiring

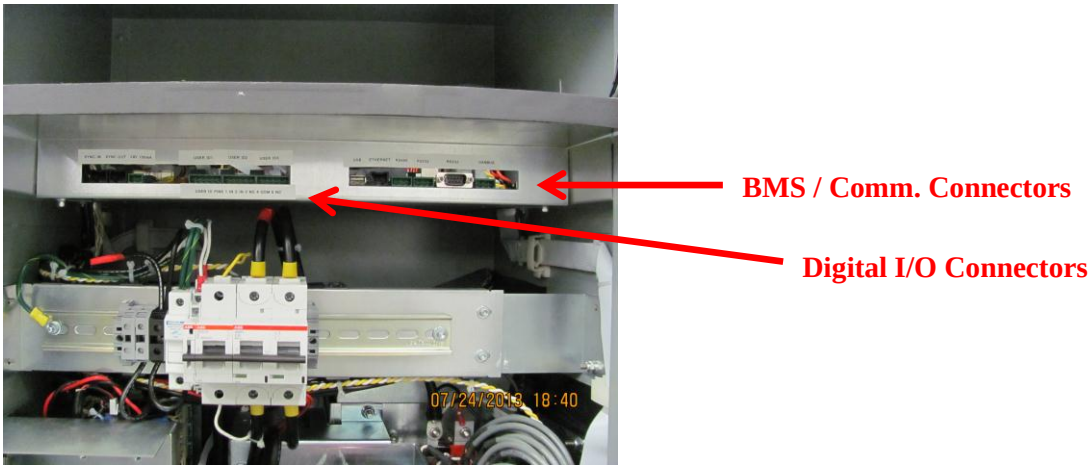


Figure 28: Signal connectors.

This section provides information about the digital inputs, digital outputs, Battery Management Systems (BMS) connections, and USB and Ethernet communication ports. These connectors are located in the upper section of the enclosure.

4.13.1 Digital Inputs

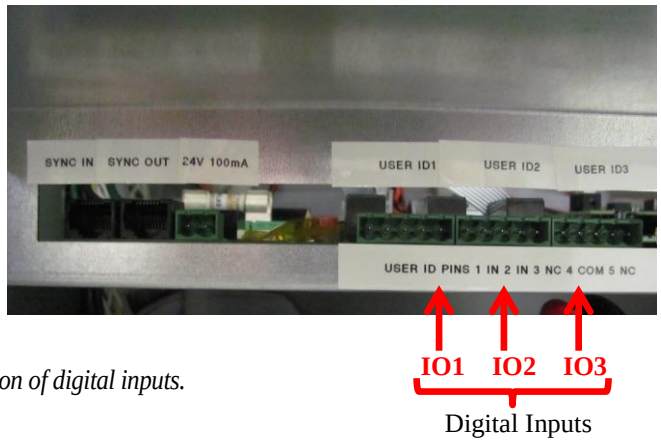


Figure 29: Location of digital inputs.

The GTIB-30 has up to three dedicated digital inputs in the upper left of the enclosure if the optional GTIB-30 Client I/O device is installed.

Of the three standard inputs on the GTIB-30 Client I/O device, three can be used as feedback signals for the digital outputs of the GTIB-30. If feedback signals for the outputs are not required, these can be used as additional independent digital inputs.

The digital inputs work on 24V logic and are optically isolated from the rest of the system. A 24V power supply is available on the GTIB-30 Client I/O device should it be required (available on J12 connector of GTIB-30 Client I/O device).

The polarity of the input is not important. Maximum current drawn by each input at 24V is 60mA while the expected current consumption is below 20mA.

The digital input parameters of the optional GTIB-30 Client I/O device are summarized in Table 8.

Table 8: Digital Input parameters of GTIB-30 Client I/O device.

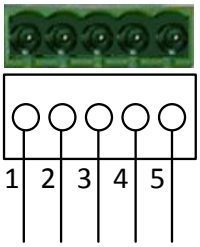
Input High	24V
Input Low	0V
Maximum current drawn (at 24V)	60mA
Expected current drawn (at 24V)	<20mA
Polarity	Either

The input signals must be wired as indicated in the digital input connectors on the optional GTIB-30 Client I/O device. Refer to Figure 29 for connector locations, Table 9 for connector descriptions, and to Figure 30 for the connector pin out diagram.

Table 9: Digital input connectors on optional GTIB-30 Client I/O device.

Description	**Connector**
Digital input assigned to digital output 1	IO1
Digital input assigned to digital output 2	IO2
Digital input assigned to digital output 3	IO3

The pinouts for these three connectors are identical and are shown in Figure 30.



Pin 1 Input
Pin 2 Input
Pin 3 NC
Pin 4 Common
Pin 5 NC

Figure 30: Digital input connector pin outs

Please contact PPS for assistance in configuring specific functions for these digital inputs.

4.13.2 Digital Outputs

The GTIB-30 has up three dedicated digital outputs if the optional GTIB-30 Client I/O device is installed.

The three digital outputs are realized via three SPDT relays on the optional GTIB-30 Client I/O device. A functional schematic of the SPDT relay is shown in Figure 31. The switch position is controlled by the GTIB-30 via the coil. The user has access to the normally open (NO), normally closed (NC) and the common (Common) connection of the relays.

These relays are associated with the IO1, IO2, and IO3 connectors described in the previous section.

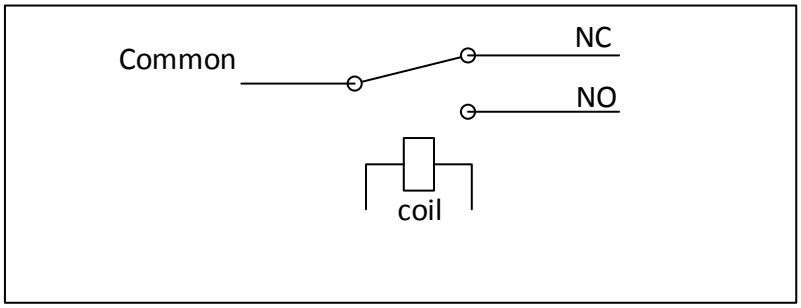


Figure 31: Functional diagram of SPDT relay on optional GTIB-30 client input/output PCB

*(** used for digital outputs)*

The specifications of the relay contacts are provided in Table 10. Exceeding these specifications will permanently damage the device and its components. Should higher current rating be required, the built in relay can be configured to switch larger external power relays.

Table 10: Digital output relay contact specifications of the optional GTIB-30 Client I/O device.

Rated Contact Current	1A
Rated Voltage	24VAC/DC
Breaking Capacity Max.	24VA

4.13.3 External Control Interface Connection

Communication between the external controller and the GTIB-30 must occur via standard Modbus protocol using either RS485 or RS232. Certain parameters will need to be set on the GTIB-30 to enable correct communication with different control systems. Contact PPS to ensure compatibility with your external control system.

The external control needs to be connected to the RS485 connector for RS485 operation; for RS232 operation, either of the RS232 connections can be used. These connections are shown in Figure 32, Figure 33, Figure 34, and Figure 35.

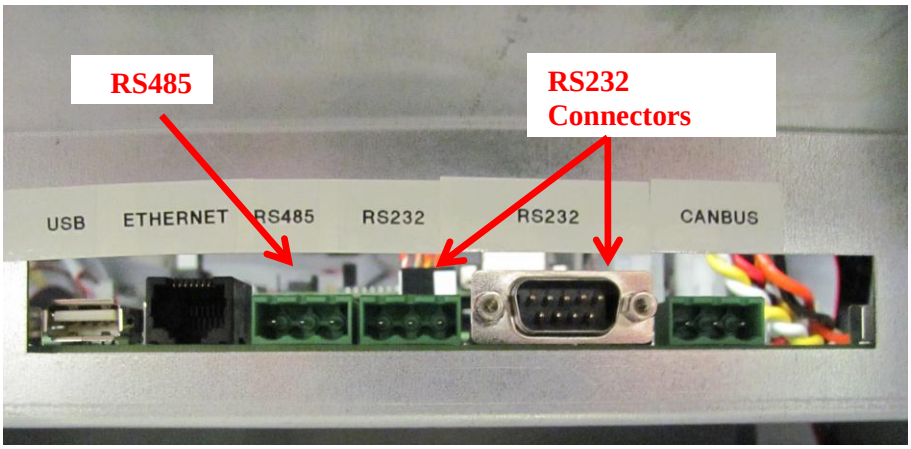


Figure 32: Connection points for BMS.

RS485 Pinouts: Apply jumper on the board if this is termination equipment.

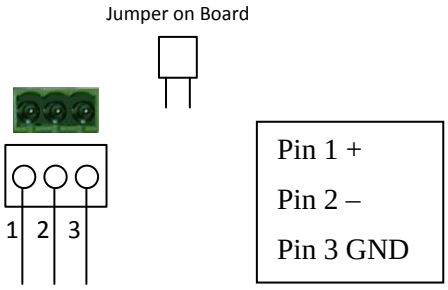


Figure 33: RS 485 Pin outs.

RS232 Pin outs: The communication interface has a 3-pin and a DB-9 connector for RS232 communication. Either can be used.

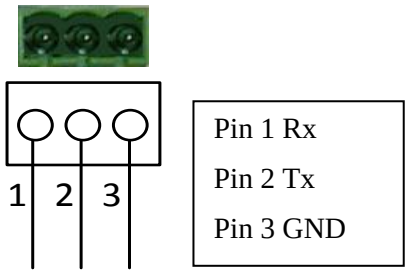


Figure 34: RS 232 (3-pin) Pin outs.

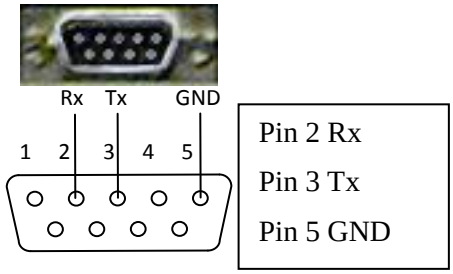


Figure 35: RS 232 (Male DB-9) Pin outs.

4.13.4 Other Communication Ports

4.13.4.1 USB devices

The GTIB-30 Communication interface allows the connection of a single USB storage device equipped with a standard "Type A" plug to the system. If required, plug a USB storage device into the USB "Type A" receptacle at the location marked by the red square in Figure 36.

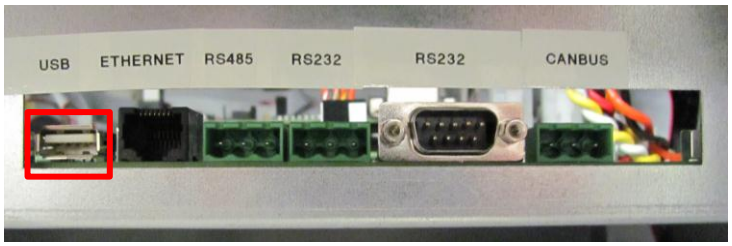


Figure 36: Location of the USB connection.

4.13.4.2 Ethernet Connection

The GTIB-30 Communication interface allows an Ethernet connection to be established with the system. If required plug a standard 8P8C Ethernet connector into the RJ45 receptacle on the system communications device marked by the red square in Figure 37.

Figure 37: Location of the Ethernet RJ-45 receptacle.

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5 Commissioning Sequences

This section provides checklists to be used during and after installation of the GTIB-30. These checklists cover only the most common and critical aspects for all types of installations. They are intended to be used as a guide only and are not intended to be an exhaustive instruction set. Always refer to the relevant sections in this manual for additional critical information and safety warnings!

5.1 Wiring Checklist

√	Item	Info
	System ground connected to Ground Stud (Grid port ground terminal or earth spike)	Required
	External AC Grid disconnect/circuit breaker	Required
	AC Grid Port wiring (3 or 4 wires) (correct phase sequence required)	Required
	External Battery Port circuit disconnect	Required
	DC port wiring (2 wires)	Required
	DC enclosure grounding	Required
	PV Panel frame grounding via special PV Ground terminal	Required. Must use external GFDI if internal GFDI is not installed. Panels can be grounded to any ground terminal if external GFDI is used.
	PV conductor grounding	Allowed
	External AC Load Port disconnect/circuit breaker	Required
	AC Load Port wiring (3 or 4 wires) (correct phase sequence required)	Required
	AC Load Port grounding	Required
	Battery temperature sensor connection	Recommended
	PV temperature sensor connection	Recommended

5.2 Commissioning Checklist

√	Item	Info
All Systems		
	Open External Load Port Disconnect	
	Open External Grid Port Disconnect	
	Open External DC disconnect	
	Open Integrated Grid switch (if installed)	
	Open Integrated DC switch	
	If the DC port is connected to Battery	
	a. Measure and verify battery voltage on battery side of External DC disconnect in range	Must be < 600V.
	b. Visually check battery polarity if possible.	
	c. Close External DC disconnect	Ensure internal DC disconnect is open!
	d. Check polarity of battery voltage on terminal blocks inside GTIB-30	24V Power supply inside GTIB-30 will power up if batteries sufficiently charged.
	e. Close integrated battery switch	
	If DC port is connected to PV array	
	a. Measure and verify PV voltage on PV array side of External DC disconnect	Must be <600V
	b. Visually check PV polarity if possible	
	c. Close External DC disconnect	
	d. Check polarity of PV voltage on terminal blocks inside GTIB-30	
	e. Close integrated DC disconnect	

√	Item		Info
		Measure and verify grid voltage in range and frequency on grid side of external grid disconnect	Only performed when grid is available
		Close external grid disconnect	Only performed when grid is available
		Measure grid voltage and frequency in range and correct sequence inside GTIB-30 on terminal blocks	Only performed when grid is available.
		Open integrated DC disconnect	
		Open external DC disconnect	24V power supply inside GTIB-30 will power down again if on previously.
		Open external Grid disconnect	
		Wait 5 minutes for internal DC Bus to discharge	
		Close external DC disconnect	Ensure integrated battery disconnect is open! 24 V PSU inside GTIB-30 will power up if battery is sufficiently charged.
		Close external Grid disconnect	Only performed if grid is available
		Close integrated DC disconnect	
		Close integrated grid disconnect	Only necessary when grid connection available. 24 V PSU in GTIB-30 will power up if battery was insufficiently charged and grid is available.
		Close integrated control power disconnect	HMI and other control systems should power up.
		Close and lock enclosure front door	
		Verify correct grid voltage and frequency measurements on HMI	Refer to GTIB-30 user manual for HMI operation.
		Proceed with system configuration via HMI as explained in user manual	System parameter configuration must be performed before unit is turned on!

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A GTIB 30 kW Specifications

A.1 System Specifications

Table 11: GTIB-30 Key Specifications.

General Specifications		
Inverter Technology	High-frequency PWM	
Size (w,d,h) and Weight	19.7”(500mm) 15.8”(400mm) 75”(1900mm), 560lbs (254kg)	
Input Specifications		
DC Voltage	280-600 VDC Full power	
DC Current	120 A Max	
Input Specifications - Battery		
Max Input Power (Discharge)	32 kW	
Max Output Power (Discharge)	28 kW	
Battery Management System	Configurable -3-stage profile for lead-acid batteries. 3rd party BMS interface (RS485 with Modbus RTU host – inquire with PPS for parameter mapping service.)	
Input Specifications - PV		
PV MPPT Range	280 - 580 VDC	
PV Array Configuration	Monopole negative grounded	
DC Voltage Ripple	< 1%	
Grid Connection Port Specifications		
	GTIB-480-30	**GTIB-208-30**
AC Line Voltage	480 VAC +10%, -12%, 3-phase	208 VAC +10%, -12%, 3-phase
AC Line Frequency	60 Hz nominal 59.3-60.5 Hz range (field adjustable)	
Continuous AC Current	40 A RMS	85A RMS
Continuous AC Power	30 kVA	
Power Factor	0-1.00 leading or lagging (adjustable power factor)	
Current Harmonics	IEEE 1547 Compliant, <5% THD	
AC Output Port Specifications		
	GTIB-480-30	**GTIB-208-30**
AC Output Voltage	480 VAC ± 10%, 3-phase	208 VAC ± 10%, 3-phase
Voltage Harmonics	IEEE 1547 compliant, <3% THD (Resistive Load)	
Maximum Load Power	30 kVA	
Allowable Load Power Factor	-0.5 -> 1.0 -> +0.5	
Maximum Load Current	40 A RMS	85 A RMS
Backup Auto-transfer time	To Backup: Seamless to IEEE (less than 16ms) To Line: Seamless to IEEE (less than 16ms)	

Environmental Specifications	
Temperature Operating	0 to 40°C
Storage	-20 to 60°C
Humidity	5-95% (non-condensing)
Cooling	Forced Air
Rated Max Elevation	3,000 Feet
Enclosure	NEMA 3
Safety Features	
Faults	Over/Under Voltage, Over/Under Frequency, Over Current, Overload, Over-temperature
Standards Compliance	IEEE 1547, UL 1741 (Pending)
Safety Features	Anti-islanding (grid fault detection, isolation & auto-reconnect), UL-compliant trip points (field adjustable)
User Interface Features	
Front Panel Interface	Touch screen viewable in and protected from sunlight
Communication	MODBUS Over RS485 and RS232
Efficiency	
Peak Efficiency	96.5%
CEC Efficiency	95.0%
Nighttime TARE Losses	40 W
Energy-saving Features	Automatic internal subsystems power-down, Night time transformer auto-disconnect, Smart load-shedding and Smart Relays.

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B Return Material Authorization, Contact, and Product Information

B.1 Return Material Authorization Policy

Before returning a product directly to PPS, you must obtain a Return Material Authorization (RMA) number and the correct factory "Ship To" address. Products must also be shipped prepaid. Product shipments will be refused and returned at your expense if they are unauthorized returned without an RMA number clearly marked on the outside of the shipping box, if they are shipped collect, or if they are shipped to the wrong location.

When you contact PPS to obtain service, please have your instruction manual ready for reference and be prepared to supply:

- The serial number of your product
- Information about the installation and use of the unit
- Information about the failure and/or reason for the return
- A copy of your dated proof of purchase

Record these details on page 76.

B.2 Out of Warranty Service

For information regarding out of warranty service, contact a PPS Customer Service Representative.

B.3 Contact Information

Corporate Headquarters
Princeton Power Systems
3175 Princeton Pike
Lawrenceville, NJ 08648
USA

Tel: +1 609.955.5390
Fax: +1 609.751.9225
Email: info@princetonpower.com

Technical Support
Email: support@princetonpower.com
Tel. +1 609.955.5390

Sales
Email: sales@princetonpower.com
Tel. +1 609.955.5390

www.princetonpower.com

B.4 Information About This System

Record the following information and be sure to keep your proof of purchase.

- ❒ Serial Number _____
- ❒ Purchased From _____
- ❒ Date of Purchase _____

If you need to contact Customer Service, please record the following details before calling. This information will help our representatives give you better service.

- ❒ Type of installation (e.g. PVwith storage, EV Charging, Micro grid) _____
- ❒ Length of time inverter has been installed _____
- ❒ Battery/battery bank size _____
- ❒ Battery type (e.g. PbA, LiPh, PbC, other) _____
- ❒ DC wiring size and length _____
- ❒ Alarm sounding? _____
- ❒ Description of indicators on front panel _____
- ❒ Appliances operating when problem occurred _____
- ❒ Description of problem _____

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